UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/734,261	12/15/2003	Mitsugu Sato	H6808.0005/P005-A	1481

24998 7590 09/23/2008

DICKSTEIN SHAPIRO LLP
1825 EYE STREET NW
Washington, DC 20006-5403

EXAMINER	
JOHNSTON, PHILLIP A	
ART UNIT	**PAPER NUMBER**
2881	
MAIL DATE	**DELIVERY MODE**
09/23/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/734,261	Applicant(s) SATO ET AL.	
	Examiner PHILLIP A. JOHNSTON	Art Unit 2881	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 June 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *24-34* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *24-34* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 December 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☒ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Detailed Action

1. This Office Action is submitted in response to the RCE/Amendment filed 6-25-2008, wherein claims 24 and 34 are amended, and claim 35 is canceled. Claims 24-34, are pending.

Claims Rejection – 35 U.S.C. 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 24-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over USPN 5,627,373 to Keese, in view of Onoguchi, USPN 6,067,164 .

4. Regarding claim 24, Keese discloses an SEM in Figure 1 below that includes;

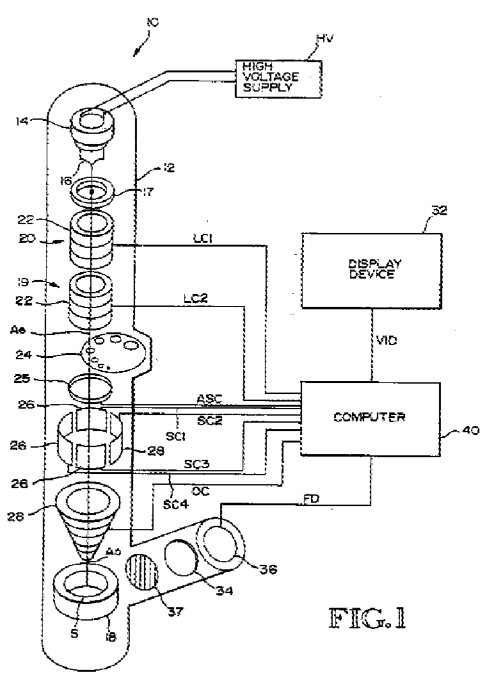


FIG. 1

an electron gun 14 (the particle source), condenser lenses 19 and 20 alignment coils 22 (deflectors), astigmatism coil 25, and objective lens 28 (optical element), which focuses the beam onto specimen S. See Col. 4, line 23-44.

Computer 40 (control device), which automatically varies the focus of objective lens 28 between extremes of the focal range (a variation of an operation condition).Col. 5, line 25-34.

Computer 40 also uses pattern recognition circuit 48 and control circuit 50 at Col. 5, line 38-44 to perform Beam Alignment and Astigmatism Correction (two different alignment conditions), where Beam Alignment is carried out along both x and y axes (two dimensional). Col. 7, line 11-20.

Regarding the amended limitation, wherein the control device obtains a relational expression between the alignment condition and the two dimensional deviation based on each of the alignment conditions and each of the two dimensional deviations corresponding to the alignment conditions, and wherein the control device calculates a signal supplied to the alignment deflector with the calculated condition based on the relational expression so that the two dimensional deviation becomes zero or nearly zero regardless of variation of an operation condition of the optical element.

Kesse discloses, at Col. 2, line 60 -67; and Col. 3, line 1-15, performing a beam alignment process with computer 40 that includes;

(a) Imaging a sample aperture having a straight edge along a first axis,

(b) Varying the focusing of the objective lens between extremes of the focus range,

(c) Using the pattern recognition circuit to determine and generate signals indicating the straight edge position in the field of view of the image at the extremes of the focus range,

(d) Using a control circuit to store and compare the edge image position indicator signals to determine image translation of the straight edge for the two extremes (calculating the deviation when the condition of the optical element is varied),

(e) Generating coil control signals and adjusting electron beam alignment along the first axis according to the position indicator signals,

(e) Completing steps (b) through (e) with a second image of the sample having a straight edge oriented along a second axis orthogonal to both the first axis and the electron beam axis, and repeating the process steps iteratively for image sample straight edges at successive 90 degree angular offsets, and

(f) Stopping when the pattern recognition circuit detects substantially no translation of a straight edge (the deviation becomes zero), when the focus of the objective lens is varied at two extremes of the focus range.

Keese fails to disclose the use of a relational expression between the alignment condition and the two dimensional deviation.

Onoguchi discloses a technique for automatic adjustment of objective lens alignment of a scanning electron microscope that includes calculating the amount of image shift resulting from adjusting the focal point of an objective lens by using equations (8) and (9), which describe the relationship between moving amounts Tx and Ty and focal point adjustment amounts Sn. See Col. 12, line 25-60, such that when the image moving amounts Tx and Ty are less than prescribed tolerable amounts Cx and Cy (the deviation becomes zero or nearly zero) the adjustment of the electron optics is ended. Col. 13, line 9-23. Onoguchi also discloses a process for calculating adjustment amounts for astigmatism correction. See Col. 19, line 45-67; and Col. 20, line 1-59.

Onoguchi modifies Keese to provide calculated image moving amounts of binarized partitioned images using a set of equations that describe the correspondence between the moving amount of an image feature in relation to the focal point adjustment amount in units of pixels from which optics adjustment signals are generated for carrying out the alignment adjustment for the objective lens. Col. 12, line 49-67.

Therefore it would have been obvious to one of ordinary skill in the art that Keese would use the relationships of Onoguchi, to provide a technique for processing images that makes it possible to automatize the SEM electron optics adjustment operation thereby increasing the throughput of the semiconductor inspection process.

5. Regarding claims 25, 26, 28, and 33, the combination of Keese and Onoguchi discloses calculating the amount of image deviation in units of pixels to automatically adjust the beam alignment and correcting for astigmatism resulting from an objective lens focus adjustment, as described above regarding claim 24. Keese also teaches the use of a pattern recognition circuit that analyzes the image of a straight edge and generates signals IND (an unknown number) for indicating the straight edge position in the field of view of the image at the extremes of the focus range. Col. 5, line 37-54.

6. Regarding claim 27, Keese fails to disclose the use of a coefficient to determine the condition of the alignment deflector.

Onoguchi discloses the use of a correlation coefficient to calculate the correlation between image regions for determining image moving amounts resulting from adjusting a lens or deflector. See Col. 13, line 24-45; and Col. 17, line 5-45.

Onoguchi modifies Keese to provide an image correlation coefficient that is used in a process for calculating the moving amount of a sample image with respect to focal point adjustments based upon the level of correlation between images.

Therefore it would have been obvious to one of ordinary skill in the art that Keese would use the correlation coefficient of Onoguchi, to provide the moving amounts of the sample image by carrying out the correlation calculation between a plurality of images so that the sample image can be obtained relatively easily, thereby realizing automatic adjustment of the electron optics system in an electron optics device such as scanning electron microscope.

7. Regarding claims 29-31, Keese fails to teach quantifying the structure information.

Onoguchi discloses the use of a gray scale threshold for performing binarization of each SEM image at Col. 15, line 5-21; and Col. 16, line 8-15, which one of ordinary skill would recognize that the threshold is a quantified value.

Onoguchi discloses performing a histogram calculation for a particular image region that is based on the frequency of occurrence of gray scale levels ranging from 1 to 256 in the image area. The threshold value is then calculated from the histogram by a statistical process. Examples of the binarization threshold calculation and the resulting binarization images obtained using different focal point adjustment amounts are shown below in Figures 16, 17 and 18.

FIG.16

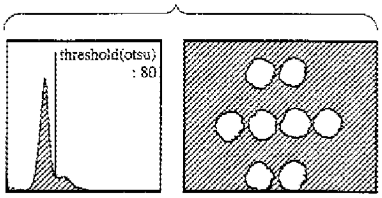


FIG.17

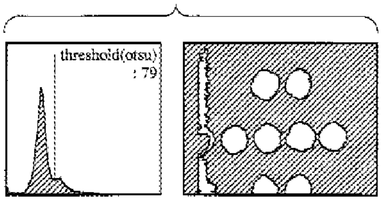
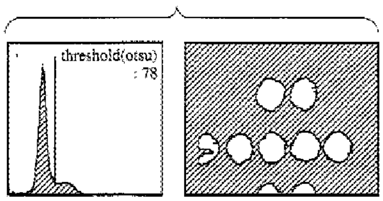


FIG.18



The threshold value is shown on the left, and the binarized image is shown on the right.

One of ordinary skill would recognize from the Figures above that the calculated threshold value on the left is proportional to the gray scale value of the image on the right, where the gray scale is determined by the concentration of contact hole features. Therefore one of ordinary skill would recognize that the threshold value of Onoguchi includes the presence or absence of structure information.

Onoguchi modifies Keese to provide a threshold for the binarization processing that is calculated by carrying out the statistical processing on a plurality of images, and each image is binarized by using the calculated threshold, so that the expected kinds of image features can be extracted as the label regions

Therefore it would have been obvious to one of ordinary skill in the art that Keese would use the threshold calculation of Onoguchi, to provide high precision optics system adjustments even when the image is blurred due to the focal point adjustment.

8. Regarding claim 32, Keese fails to teach quantifying the structure information using a Fourier transform.

Onoguchi discloses measuring the moving amount of an image feature in relation to the focal point adjustment amount at Col. 10, line 1-6, and using labeling of regions in the binarized image and a feature value calculation for processing only expected kinds of image features extracted as the label regions. Col. 11, line 28-38.

Onoguchi teaches a Fourier transform unit for calculating a power spectrum by applying a two-dimensional Fourier transform to the secondary particle signals extracted by the secondary particle signal extraction unit; a binarization unit for binarizing the power spectrum calculated by the Fourier transform unit to obtain a binarized image. Col. 5, line 26-48.

Onoguchi also discloses applying a Fourier transform to a sample having circular patterns, where the use of low frequency components of the Fourier transform identify the structural features of a standard sample. Col. 21, line 57-62.

Onoguchi modifies Keese to provide a Fourier transformed image from which intensity of low frequency components define the presence of sample features and thereby adjusting the stigmater of the charged particle beam optical system according to the intensity and the direction of the astigmatism determined by the astigmatism information calculation unit.

Therefore it would have been obvious to one of ordinary skill in the art that Keese would use a Fourier transform in accordance with Onoguchi, to provide an astigmatism correction technique for correcting astigmatism in an electron optics device.

9. Regarding claim 34, the combination of Keese and Onoguchi teaches the apparatus used in this method claim, as described above regarding claim 24.

Conclusion

10. Any inquiry concerning this communication or earlier communications should be directed to Phillip Johnston whose telephone number is (571) 272-2475. The examiner can normally be reached on Monday-Friday from 7:00 am to 4:00 pm. If attempts to reach the examiner by telephone are unsuccessful, the examiners supervisor Robert Kim can be reached at (571)272-2293. The fax phone number for the organization where the application or proceeding is assigned is 571 273 8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

PJ

September 18, 2008

/Phillip A Johnston/

Examiner, Art Unit 2881